

**Table S1.** Clause learning algorithm**Clause Learning Algorithm ( $\mathbf{S}$ ,  $k$ ):****Input:**A set  $\mathbf{S}$  of already-available labeled sequences $k$ : assumed upper-bound length of clauses (a small positive integer)**Steps:**

1. Enumerate all combination of literals to form conjunction clauses

2. Record the set of (positive and negative) sequences that each clause covers ( $n_j^+, n_j^-$ )**Output:**The set of clauses  $C$  and the corresponding sequence index sets ( $N^+, N^-$ )